

Foreword

How Forecasts Are Made

Most of the annual streamflow in the Western United States originates as snowfall. This snowfall accumulates high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are viewed in conjunction with snowpack data to prepare runoff forecasts. This report presents a comprehensive picture of water supply outlook conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data and narratives describing current conditions.

Streamflow forecasts are cooperatively generated by Soil Conservation Service and National Weather Service hydrologists. Forecasts become more accurate as more data affecting runoff becomes known. For this reason, forecasts are issued that reflect three future precipitation conditions — Below Normal, Average, and Above Normal. These forecasts are termed reasonable minimum, most probable, and reasonable maximum. Actual streamflow can be expected to fall between the lower and upper forecast values eight out of ten years.

Snowpack data are obtained by using a combination of manual and automated measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation, temperature, and other parameters are monitored on a daily basis and transmitted via radio telemetry to central data collection facilities. Both monthly and daily data are used to project snowmelt runoff.

For More Information

Copies of Monthly Water Supply Outlook Reports and other reports may be obtained from the states listed below. Because of the limited space, snow survey measurements are not published in monthly reports. An annual snow survey data summary is published by the Soil Conservation Service for each of the western states. Historical snow survey data may be obtained at those same offices.

STATE	ADDRESS
Alaska	201 East 9th Ave., Suite 300, Anchorage, AK 99501-3687
Arizona	201 East Indianola, Suite 200, Phoenix, AZ 85012
Colorado (New Mexico)	2490 West 26th Ave., Denver, CO 80211
Idaho	304 North 8th Street, Room 345, Boise, ID 83702
Montana	10 East Babcock, Room 443, Federal Building, Bozeman, MT 59715
Nevada	50 South Virginia Street, Third Floor, Reno, NV 89505
Oregon	1220 Southwest 3rd Ave., 16th Floor, Portland, OR 97204
Utah	4402 Federal Building, 125 South State Street, Salt Lake City, UT 84147
Washington	360 U.S. Court House, Spokane, WA 99201
Wyoming	Federal Building, 100 East "B" Street, Casper, WY 82602

In addition to state reports, a Water Supply Outlook for the Western United States is published by the Soil Conservation Service and National Weather Service monthly, January through May. Reports may be obtained from the Soil Conservation Service, West National Technical Center, 511 Northwest Broadway, Room 547, Portland, OR 97209.

Published by other agencies:

Water Supply Outlook Reports prepared by other agencies include: California — Snow Survey Branch, California Department of Water Resources, P.O. Box 388, Sacramento, CA 98502; British Columbia — The Ministry of Environment, Water Investigations Branch, Parliament Buildings, Victoria, British Columbia, V8V 1X5; Yukon Territory — Department of Indian and Northern Affairs, Northern Operations Branch, 200 Range Road, Whitehorse, Yukon Territory, Y1A 3V1; Alberta, Saskatchewan, and N.W.T. — The Water Survey of Canada, Inland Waters Branch, 110-12 Avenue S.W., Calgary, Alberta, T3C 1A6.

Arizona Water Supply Outlook

and

Federal-State-Private Cooperative Snow Surveys

Issued by

Wilson Scaling
Chief
Soil Conservation Service
Washington, D.C.

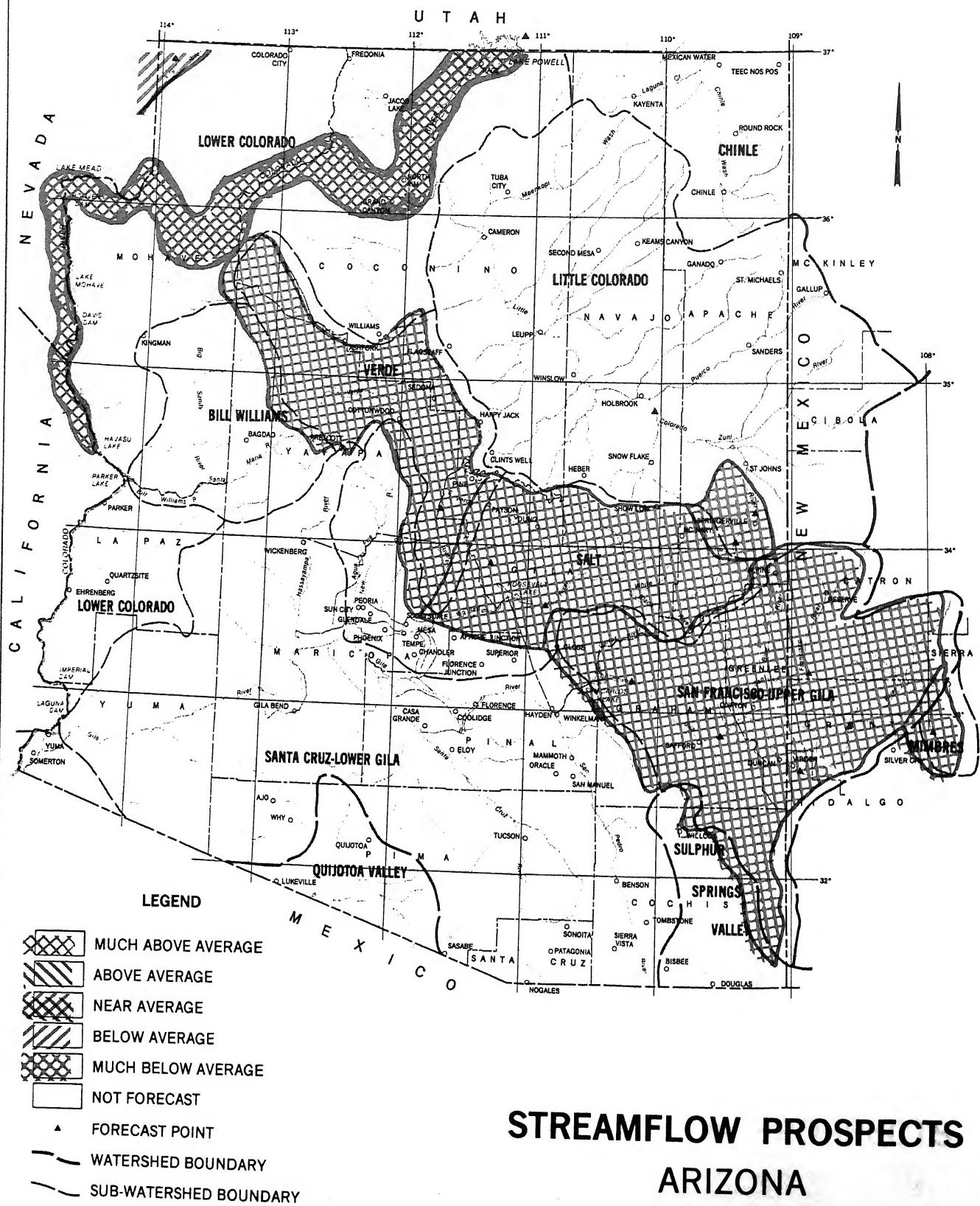
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'Programs and assistance of the United States Department
of Agriculture are available without regard to race, creed,
color, sex, age, or national origin.'



SOURCE: Data compiled by SCS
Field Personnel.

DALLAS TEXAS 1985

MARCH 1985 4-R-39105

GENERAL OUTLOOK

SUMMARY:

The general outlook still calls for variable surface water supplies in Arizona. Although reservoir storage is near to above normal for March 1, the forecasts for March-May streamflow are still well below average. This is somewhat of a paradox since fairly abundant precipitation, combined with snowmelt from a period of above average temperatures, produced near average runoff on many streams during February. Streamflow forecasts are low because very little snowpack remains. Runoff is expected to be 33% of average on the Salt River and 27% on the Verde. Inflow to Salt River Project is forecast at 167,000 acre feet. The San Francisco River is forecast to run 64% of average at Clifton. Forecast on the Gila River call for 67% of average at Virden, 62% at Head of Safford Valley, and 44% at Calva. Inflow to San Carlos reservoir should run 35,000 acre feet. The Little Colorado River is forecast to produce 34% of average flow at Lyman Lake. The forecast of the Colorado River at Lake Powell has increased to 11,000,000 acre feet at 147% as a result of February storms.

SNOWPACK:

The March 1 snowpack is again much below average over most of the basins even after a significant increase in snowfall during mid February. Late February experienced a mini heat wave when temperatures over the state reached as much as 20 F. above normal for several days in succession. This resulted in rapid snow melt. Percent of average snow water on March 1 generally ranged from 23% on the Verde River to 63% in the Grand Canyon area. The extremes were 7% on the Mimbres and 99% on the San Francisco Peaks.

PRECIPITATION: February precipitation was well above average on most basins. The San Francisco-Gila River basin received the highest percent of average with 201%. The Lower Colorado River area in northwestern Arizona was the lowest with 82% of average. Precipitation was spread over the first 17 days of the month with a major storm at mid month which produced abundant snowfall. Very little precipitation occurred after this and most of the new snow melted before the end of the month. Water year precipitation is below average on the Salt, Little Colorado, and Lower Colorado basins, near average on the Verde River, and above average on the Mimbres and San Francisco-Gila watersheds.

RESERVOIRS:

Near average to above average storage is reported in major Arizona reservoirs for March 1. The six Salt River Project reservoirs are reported to have a combined storage of 1,761,000 acre feet at 87% of capacity. San Carlos reservoir is 95% full with 890,000 acre feet. Storage in Lake Pleasant is 83,000 acre feet at 53% of capacity. Total storage in Lakes Powell, Mead, Mohave and Havasu is 47,924,000 acre feet which is 89% of capacity. February runoff has increased the storage in many smaller reservoirs. Watson Lake holds 4170 acre feet and Willow Lake, 3580 acre feet. Lyman Lake contains 24,400 acre feet while Show Low Lake has increased to 2600 acre feet.

STREAMFLOW:

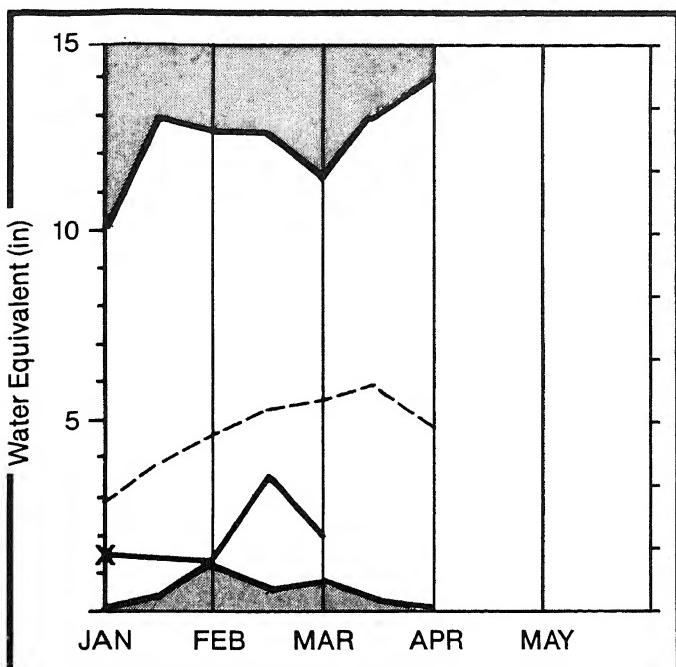
Runoff increased in February in response to rain during the first half of the month and fairly rapid snowmelt toward the end of the month. All major streams showed a dramatic increase in volume on February 16. Flow began to drop off by February 22 on most streams. The Salt River flow remained fairly high to the end of the month. Even with this the percent of average runoff was variable.

Preliminary Streamflow - February 1986

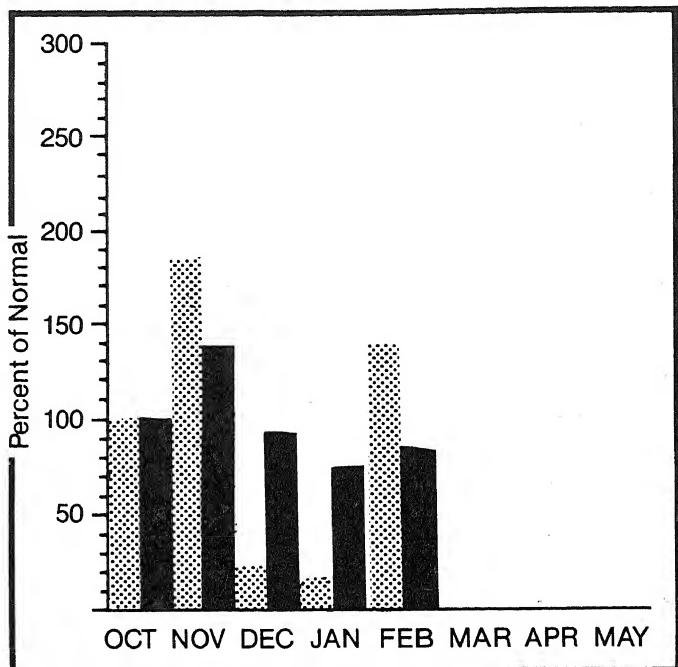
<u>Stream</u>	<u>Thousands of Acre Feet</u>	<u>Percent of Average</u>
Salt River	82.3	99
Verde River	42.5	41
Tonto Creek	11.7	54
San Francisco River		
Clifton	23.0	102
Gila River		
Virden	29.3	127
Solomon	48.8	92
Calva	40.4	91

Salt River Basin

Mountain snowpack* (inches)



Precipitation* (percent of normal)



*Based on selected stations

*Based on selected stations

Maximum [Shaded Box]

Average [Dashed Line]

Minimum [Shaded Box]

Current [Solid Line]

Monthly precipitation [Diagonal Lines]

Year to date precipitation [Solid Bar]

WATER SUPPLY

March 1, 1986

OUTLOOK:

March-May runoff is forecast to be 33% of average on the Salt River and 14% on Tonto Creek. February precipitation was 141% of average, but snow deposited on the White Mountains has already sustained significant melt. The March 1 snowpack was 34% of average. February runoff was near average on the Salt River but about half of average on Tonto Creek. Four Salt River Project reservoirs on the Salt River held 1,537,000 acre feet at 90% of capacity. Lake Pleasant reported 83,000 acre feet in storage at 53% of capacity.

SALT RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLOW (CFS)	PEAK DATE	LOW FLOW (CFS)	LOW DATE
SALT RIVER near Roosevelt	MAR-MAY	329.7	110.0	33	87	13				
	MARCH	125.6	40.0	31						
TONTO CREEK near Roosevelt	MAR-MAY	48.3	7.0	14	72	6				
	MARCH	34.1	9.5	10						

RESERVOIR STORAGE (1000AF)

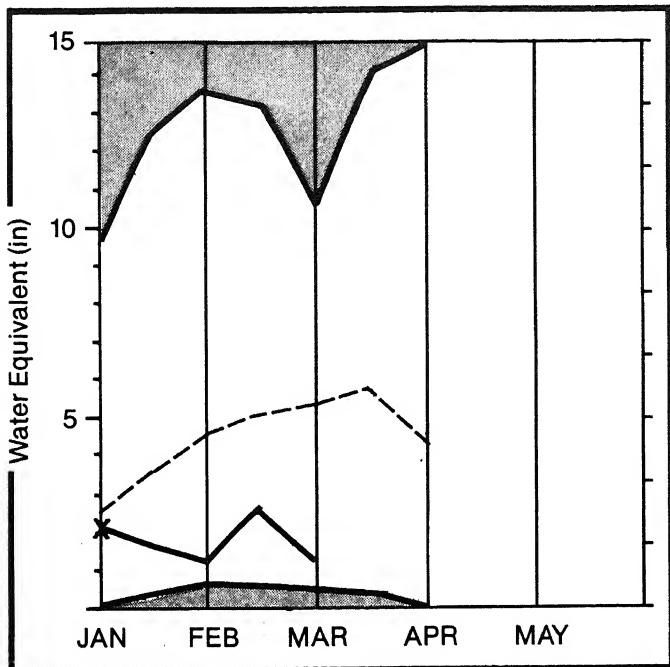
WATERSHED SNOWPACK ANALYSIS

RESERVOIR	USEABLE CAPACITY	USEABLE STORAGE			WATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF	
		THIS YEAR	LAST YEAR	AVE.			LAST YR.	AVERAGE
SALT RIVER RES SYSTEM	1709.0	1537.3	1830.0	1499.3	SALT RIVER	8	22	35
LAKE PLEASANT	157.6	93.4	122.9	77.8				

*Corrected for upstream diversions or changes in reservoir storage.
Average is for 1961-80 period.

Verde River Basin

Mountain snowpack* (inches)



*Based on selected stations

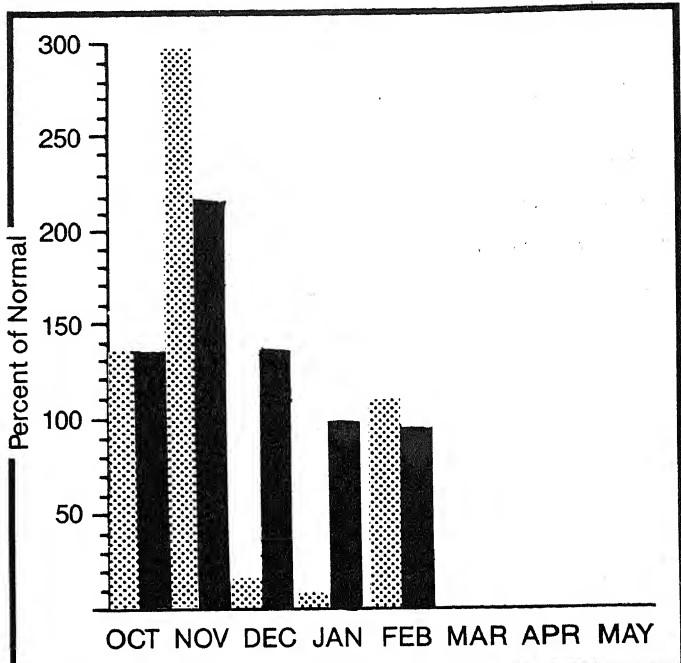
Maximum █

Average -----

Minimum █

Current ——

Precipitation* (percent of normal)



*Based on selected stations



Year to date precipitation

WATER SUPPLY

March 1, 1986

OUTLOOK:

The Verde River is forecast to produce only 27% of average runoff over the March-May period. Inflow to Lake Mary is forecast at 1600 acre feet. Runoff is expected to be only 500 acre feet on Grante Creek and 400 acre feet on Willow Creek. January precipitation was 110% of average on the watershed but the monthly runoff was 41% of average even with practically all of the snowpack melting. The March 1 snowpack was only 23% of average. The San Francisco Peaks snowpack is still normal for March 1. Combined storage in Bartlett and Horseshoe reservoirs was 224,000 acre feet accounting for 72% of their capacity. Watson Lake was up to 4170 acre feet storage and Willow Lake, 3580 acre feet.

VERDE RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLOW (CFS)	PEAK DATE	LOW FLOW (CFS)	LOW DATE
VERDE RIVER above Horseshoe	MAR-MAY MARCH	181.5 100.4	50.0 23.0	27 22	128	11				
GRANITE CREEK	MAR-MAY	—	0.5							
WILLOW CREEK	MAR-MAY	—	0.4							
LAKE MARY INFLOW	MAR-MAY	—	1.4							

RESERVOIR STORAGE

(1000AF)

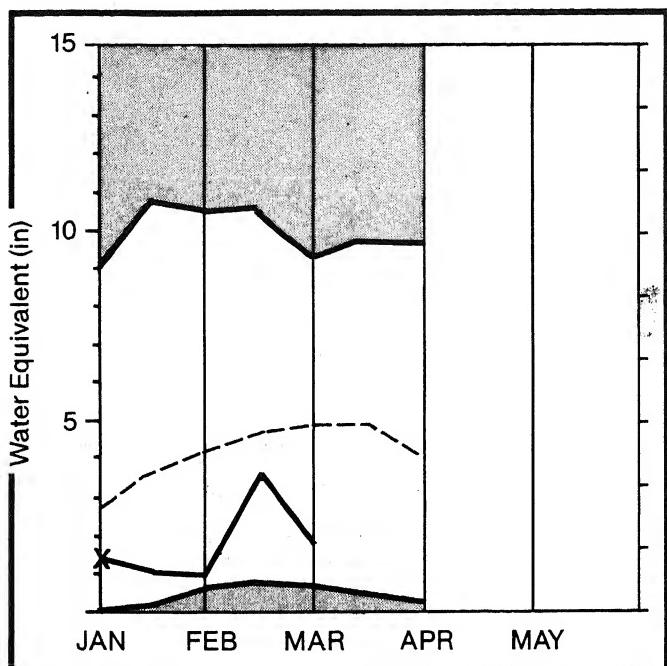
WATERSHED SNOWPACK ANALYSIS

RESERVOIR	USEABLE CAPACITY	** USEABLE STORAGE **			WATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF LAST YR. AVERAGE
		THIS YEAR	LAST YEAR	AVE.			
VERDE RIVER RES SYSTEM	309.6	224.1	272.0	147.2	VERDE RIVER	10	14 23
WATSON LAKE	4.7	4.2	4.5	3.9	SAN FRANCISCO PEAKS	4	64 99
WILLOW CREEK	6.1	3.6	6.1	3.2			

*Corrected for upstream diversions or changes in reservoir storage.
Average is for 1961-80 period.

San Francisco - Upper Gila River Basin

Mountain snowpack* (inches)



*Based on selected stations

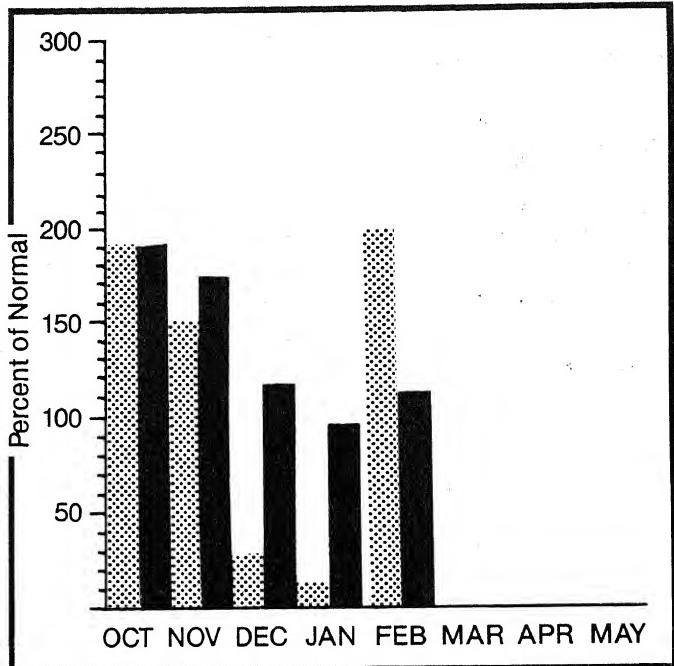
Maximum

Average

Minimum

Current

Precipitation* (percent of normal)



*Based on selected stations



Monthly precipitation

Year-to-date precipitation

March 1, 1986

WATER SUPPLY

OUTLOOK:

Runoff from the Gila River basin for March through May is forecast to be near 62% of average. Forecasts range from 74% at Gila to 44% at Calva. The San Francisco River is forecast to run 64% at Clifton. Runoff at Virden should be 67% of average and at Head of Safford Valley, 62%. San Carlos inflow is forecast at 35,000 acre feet. The basin received twice the normal February precipitation and streamflow for the month was near average. Much of the snowpack melted. The March 1 snow water equivalent was 38% of average. San Carlos storage increased to 890,000 acre feet at 95% of capacity.

SAN FRANCISCO - UPPER GILA RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE.	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLOW (CFS)	PEAK DATE	LOW FLOW (CFS)	LOW DATE
SAN FRANCISCO RIVER at Glenwood	MAR-MAY	27.5	35.0	65	175	25				
SAN FRANCISCO RIVER at Clifton	MAR-MAY	56.2	36.0	64	226	23				
GILA RIVER at Gila	MAR-MAY	43.4	32.0	73	171	30				
GILA RIVER near Virden	MAR-MAY	53.9	34.0	66	176	26				
GILA RIVER near Solomon	MAR-MAY	112.8	70.0	62	243	25				
	MARCH	55.8	31.0	55						
GILA RIVER at Calva	MAR-MAY	79.6	35.0	43	214	18				

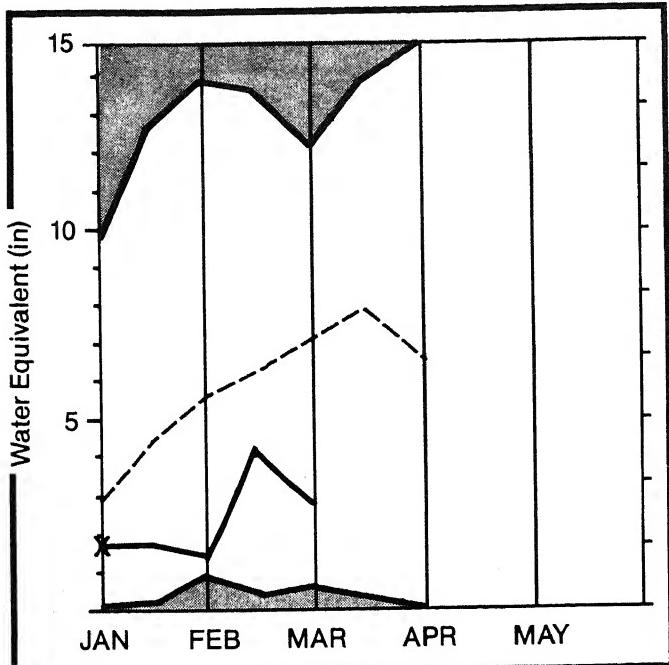
RESERVOIR STORAGE (1000AF) | WATERSHED SNOWPACK ANALYSIS

RESERVOIR	USEABLE CAPACITY	USEABLE STORAGE			WATERSHED	NO. COURSES	THIS YEAR AS % OF LAST YR. AVERAGE
		THIS YEAR	LAST YEAR	AVE.			
SAN CARLOS	935.0	889.9	932.4	303.2	SAN FRANCISCO/GILA RIVER	7	19 36
PAINTED ROCK DAM	2492.0	11.5	167.5	—			

*Corrected for upstream diversions or changes in reservoir storage.
Average is for 1961-80 period.

Little Colorado River Basin

Mountain snowpack* (inches)



*Based on selected stations

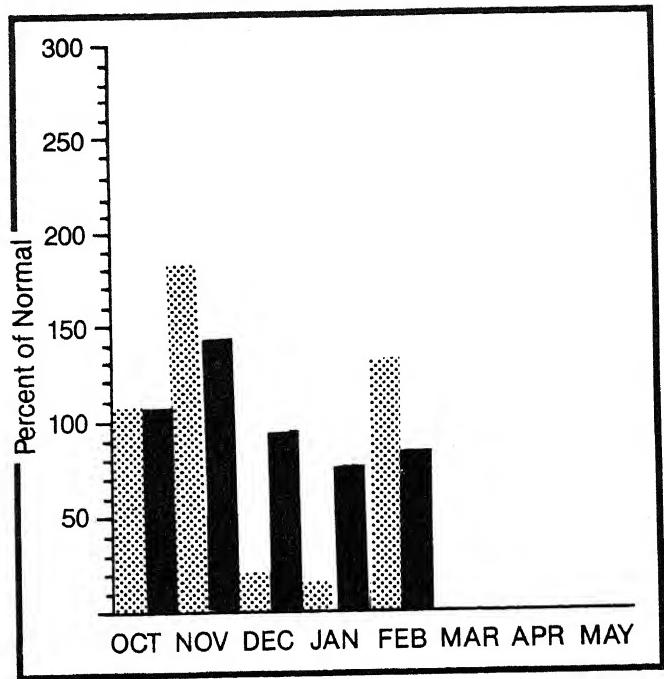
Maximum █

Average - - -

Minimum █

Current —

Precipitation* (percent of normal)



*Based on selected stations



Year to date precipitation

WATER SUPPLY

March 1, 1986

OUTLOOK:

Light runoff is forecasted at 62% of average and precipitation was 40% of average with the Chuska Mountains receiving 24,400 acre feet a

LITTLE COLORADO RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLOW (CFS)	PEAK DATE	LOW FLOW (CFS)	LOW DATE
LITTLE COLORADO RIVER at Greer	MAR-JUN	7.8	4.8	61	179	26				
LITTLE COLORADO RIVER ab Lyman Res	MAR-JUN	12.8	4.3	33	148	16				
LITTLE COLORADO RIVER at Woodruff *	NOV-JUN	17.3	6.0	34	139	12				

RESERVOIR STORAGE

(1000AF)

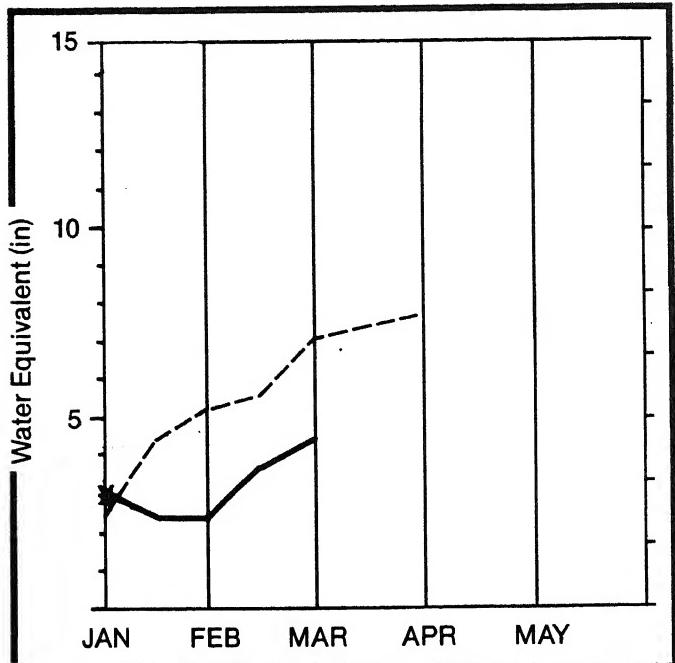
WATERSHED SNOWPACK ANALYSIS

RESERVOIR	USEABLE CAPACITY	xx USEABLE STORAGE xx			WATERSHED	NO. COURSES	THIS YEAR AS % OF	
		THIS YEAR	LAST YEAR	AVE.				
LYMAN RESERVOIR	---	24.4	25.8	---	LITTLE COLORADO RIVER	5	31	40
SHOW LOW LAKE	5.1	2.6	5.1	---	CHUSKA MOUNTAINS	5	59	90

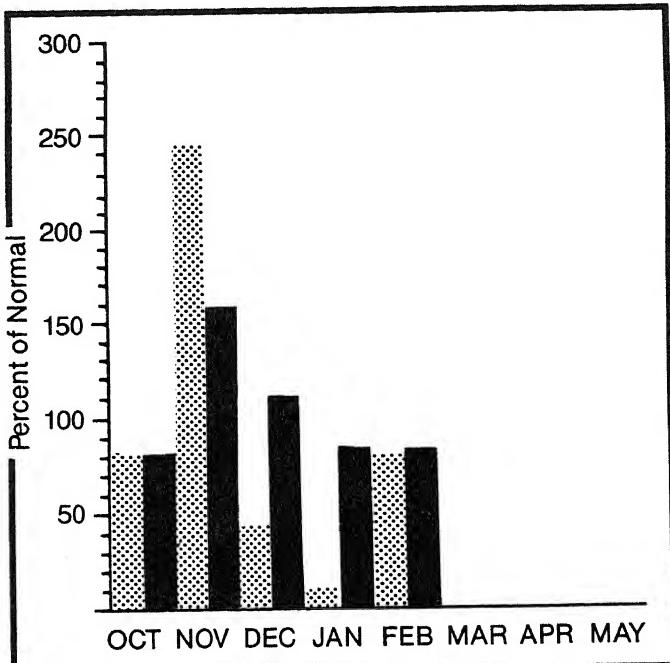
*Corrected for upstream diversions or changes in reservoir storage.
Average is for 1961-80 period.

Lower Colorado River Basin

Mountain snowpack* (inches)



Precipitation* (percent of normal)



*Based on selected stations

*Based on selected stations

Maximum |||||

Average -----

Minimum |||||

Current —————



Monthly precipitation

Year to date precipitation

WATER SUPPLY

March 1, 1986

OUTLOOK:

February storms in the Colorado basin have produced an increase in the forecast of the Colorado River. Inflow to Lake Powell is forecast to be 11,000,000 acre feet from April through July at 147% of average. The April-June forecast for the Virgin River calls for 81% of average flow. Precipitation over northwestern Arizona was 82% of average in February. The March 1 snowpack at the Grand Canyon was 63% of average. A combined storage of 47,924,000 acre feet was reported in the four major Colorado River reservoirs. This is 89% of capacity.

LOWER COLORADO RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLOW (CFS)	PEAK DATE	LOW FLOW (CFS)	LOW DATE
VIRGIN RIVER near Littlefield	APR-JUN	62.0	50.0	80	119	59				
INFLOW to LAKE POWELL *	APR-JUL	7462.0	11000.0	147	183	116				

RESERVOIR STORAGE

(1000AF)

WATERSHED SNOWPACK ANALYSIS

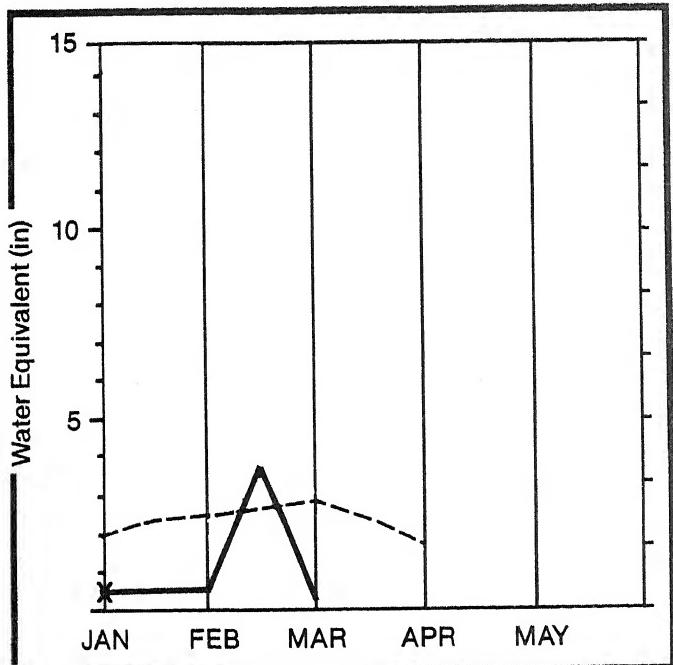
RESERVOIR	USEABLE CAPACITY	XX USEABLE STORAGE XX			WATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF LAST YR. AVERAGE
		THIS YEAR	LAST YEAR	AVE.			
LAKE HAVASU	619.4	570.7	552.0	539.0	LOWER COLORADO RIVER	2	44 62
LAKE MOHAVE	1810.0	1581.0	1732.0	1676.0			
LAKE MEAD	26159.0	23221.0	23898.0	18377.0			
LAKE POWELL	25002.0	22451.0	21349.0	11865.0			

*Corrected for upstream diversions or changes in reservoir storage.

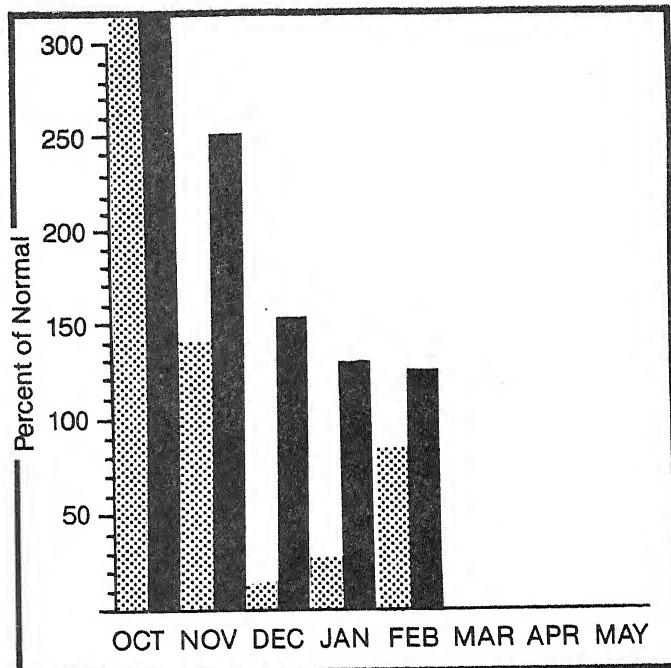
Average is for 1961-80 period.

Mimbres River Basin

Mountain snowpack* (inches)



Precipitation* (percent of normal)



*Based on selected stations

*Based on selected stations

Maximum ——————
Minimum ——————

Average - - - - -
Current ——————

Monthly precipitation

Year to date precipitation

WATER SUPPLY

March 1, 1986

OUTLOOK:

The Mimbres River is only expected to run 43% of average during the March-May period. February precipitation was 86% of average. Very little snow remains in the mountains and the March 1 snowpack was rated at 7% of average.

MIMBRES RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE.	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLOW (CFS)	PEAK DATE	LOW FLOW (CFS)	LOW FLOW (CFS) DATE
MIMBRES RIVER near Mimbres	MAR-MAY	3.5	1.5	42	114	29				

RESERVOIR STORAGE

(1000AF)

WATERSHED SNOWPACK ANALYSIS

RESERVOIR	USEABLE CAPACITY	THIS YEAR	LAST YEAR	AVE.	WATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF LAST YR. AVERAGE
					MIMBRES RIVER	3	3 4

*Corrected for upstream diversions or changes in reservoir storage.
Average is for 1961-80 period.

DATA SITES USED TO DETERMINE SNOW PACK WATER

SALT RIVER

Baldy
Beaverhead
Coronado Trail
Forest Dale Alternate
Hannagan Meadows
Heber
Maverick Fork
Workman Creek

LITTLE COLORADO RIVER

Baldy
Cheese Spring
Heber
Nutrioso
Promontory Butte

VERDE RIVER

Baker Butte
Baker Butte #2
Chalender
Copper Basin Divide
Fort Valley
Gaddes Canyon
Happy Jack
Mingus Mountain
Morman Mountain
Mormon Mt. Summit #2
White Horse Lake Jct.
Williams Ski Run

LOWER COLORADO RIVER

Bright Angel
Grand Canyon

SAN FRANCISCO PEAKS

Inner Basin #1
Inner Basin #2
Snow Bowl #1 Alternate
Snow Bowl #2

CHUSKA MOUNTAINS

Bowl Canyon
Tsaila Canyon #1
Tsaila Canyon #2
Wheatfields
Whiskey Creek

GILA/SAN FRANCISCO RIVER

Beaverhead
Coronado Trail
Frisco Divide
Hannagan Meadows
Signal Peak Snotel
Silver Creek Divide
State Line

MIMBRES RIVER

Emory Pass #2
McKnight Cabin
Signal Peak Snotel

STATIONS USED TO DETERMINE PERCENT OF NORMAL PRECIPITATION

SALT RIVER

Alpine R.S.
Baldy Snotel
Black River Pumps
Buck Spring Snotel
Coronado Trail Snotel
Hannagan Meadows Snotel
Heber Snotel
Maverick Fork Snotel
Pleasant Valley R.S.
Promontory Snotel
Sierra Ancha
Tonto Fish Hatchery
Wildcat Snotel
Workman Creek Snotel

VERDE RIVER

Ashfork
Baker Butte Snotel
Beaver Creek R.S.
Copper Basin Divide
Flagstaff
Fort Valley
Fry Snotel
Happy Jack
Mingus Mountain
Mormon Mountain Snotel
Payson R.S.
Prescott
Sugar Loaf Snotel
White Horse Lake Snotel

LITTLE COLORADO RIVER

Baldy Snotel
Buck Spring Snotel
Flagstaff
Heber Snotel
Holbrook
Mormon Mountain Snotel
Promontory Snotel
Springerville
Tuba City
Window Rock

GILA/SAN FRANCISCO RIVER

Alpine R.S.
Beaverhead R.S.
Clifton
Coronado Trail Snotel
Frisco Divide Snotel
Hannagan Meadows Snotel
Lookout Mountain Snotel
Luna R.S.
Reserve R.S.
Safford Exp. Farm
Signal Peak Snotel
Silver City
Silver Creek Divide Snotel
Fort Bayard

LOWER COLORADO RIVER

Bright Angel
Colorado City
Fredonia
Grand Canyon
Kingman
Page
Williams

MIMBRES RIVER

Mimbres R.S.
Signal Peak Snotel

The Following Organizations Cooperate With The Soil Conservation Service in Snow Survey Work

Federal

Department of Agriculture
Soil Conservation Service
Forest Service
Apache-Sitgreaves National Forest
Coconino National Forest
Coronado National Forest
Gila National Forest
Kaibab National Forest
Prescott National Forest
Tonto National Forest
Rocky Mountain Forest and Range Experiment Station
Department of Commerce
NOAA, National Weather Service
Department of Interior
Bureau of Reclamation
Region III
Geological Survey
Arizona District
New Mexico District
Bureau of Indian Affairs
Navajo Reservation
San Carlos Irrigation Project
National Park Service
Grand Canyon National Park
Gila Water Commissioner
Safford, Arizona

State

Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona State Parks Board

Arizona State University
Laboratory of Climatology
(State Climatologist)

University of Arizona
Arizona Agricultural Experiment Station
Water Resource Research Center
Department of Watershed Management

Municipal

City of Flagstaff
Salt River Valley Water Users' Association
Phoenix, Arizona
San Carlos Irrigation and Drainage District
Coolidge, Arizona
Maricopa County Municipal Water Conservation District
Peoria, Arizona

Indian Tribes

Navajo Nation
Window Rock, Arizona

Private

Southwest Forest Industries, Inc.
Phoenix, Arizona

Other organizations and individuals
reports. Their cooperation is grateful!